



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**  
**REGION 10**  
**OREGON OPERATIONS OFFICE**  
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**To:** Lower Willamette Group

**From:** EPA

**Date:** December 22, 2005

**Subject:** Benthic Interpretive Approach for Portland Harbor Ecological Risk Assessment

The following memorandum is in response to the summary of the Portland Harbor Benthic Predictive Approach meeting held on November 21, 2005 in Seattle. This summary was prepared on December 6, 2005 by Windward Environmental, Inc. The purpose of the November 21<sup>st</sup> meeting was to update the government team on the approach for predicting sediment toxicity and agree to a path forward for finalizing and submitting the benthic toxicity interpretation report.

In general, the December 6<sup>th</sup> memo accurately summarizes the meeting. However, EPA believes that certain statements in the December 6<sup>th</sup> memo require clarification. The comments provided below focus on general and specific technical issues identified by the government team. They are provided to clarify for the LWG EPA's expectations for the application of the benthic predictive approach. In addition, EPA requests that LWG provide electronic copies of the presentations from the November meeting, including a summary of data manipulation and reduction efforts.

The issues and approaches summarized in the memorandum should be incorporated into the benthic toxicity predictive approach and incorporated into the benthic toxicity interpretation report. A benthic toxicity interpretation report should be submitted as scheduled.

**General Issues:**

*Floating Percentile Model Transparency and Reproducibility:* As discussed at the meeting, an important issue that must be addressed is that of transparency and reproducibility of the Floating Percentile Model (FPM). It is imperative that the government team is able to understand and replicate the results of the FPM. It has been suggested that appropriate DEQ and Windward staff work directly together to achieve the requisite transparency. EPA supports this approach and requests that arrangements be made as soon as possible to ensure that this occurs. Absent transparency, EPA will not be in a position to consider supporting the results of the FPM.

*Purpose of the Model: Predicting Toxicity vs. Predicting Non-toxicity:* EPA would like to emphasize that the purpose of the model is to assist in remedial decision making by providing predictions of toxicity using sediment chemistry data. A model that does this effectively should provide, to the extent practicable, information about specific *contaminants*. A model that relies

only on ammonia or sulfide or a limited group of contaminants (these, of course, can be used as indicators) may be of limited utility in developing clean up levels.

*Additional Lines of Evidence:* The evaluation of benthic toxicity testing should not rely on the use of bioassays alone. The results of the bioassay tests and modeling effort have shown that additional lines of evidence may be important in interpreting the bioassay results (e.g., equilibrium partitioning approach, pore water testing or benthic tissue analysis).

### **Specific Technical Issues:**

#### *Floating Percentile Model Hyalella Growth Endpoint*

- During the meeting, LWG representatives suggested that the Hyalella growth endpoint be removed from the analysis because this endpoint is not producing reliable results. EPA and its team members do not agree with this assessment. Poor model performance is insufficient reason to ignore the most sensitive endpoint. Furthermore, the pooled growth/survival results for the selected species are a useful way to look at the growth results because growth is not independent of survival. Therefore, the Floating Percentile Model should be applied to the pooled results for each species and it should address the combined endpoints for each species.

#### *Floating Percentile Model Consideration of Hit/No-hit Thresholds and Consistency with Logistic Regression Model Thresholds*

- As stated in the memorandum, the Logistic Regression Model will include three hit/no-hit thresholds (< 90%, <80% and < 70% of control). These hit/no-hit thresholds differ from those proposed for the Floating Percentile Model. EPA believes that the Floating Percentile Model should include the same hit/no-hit thresholds as the Logistic Regression Model to ensure consistency between models. EPA agrees to allow the Floating Percentile Model to be run using the hit/no-hit thresholds described in the memorandum with the understanding that the government team will likely run the Floating Percentile Model at the three hit/no-hit thresholds (< 90%, <80% and < 70% of control) proposed for the Logistic Regression Model to provide consistency with the logistic regression modeling (LRM) approach. Based on the results of this analysis, additional hit/no-hit thresholds may need to be considered in the FPM.

#### *Approach for and Application of Summing for Classes of Contaminant Data (e.g., PCBs, PAHs, DDTs, etc.)*

- LWG proposed in November to sum DDTs, PAHs and PCBs. Although EPA agrees with summing these chemicals, it is critical that summing should be clearly supported by the results of the modeling and presented in the benthic interpretation report. For example, the Floating Percentile Model FPM analyses indicating that contaminants are correlated offers support for summation of contaminant classes. If contaminants are co-varying they will show this by where they "float" in the analysis. Strong correlations between individual PAHs and LPAH and HPAH could also support the use of LPAH and HPAH instead of

individual PAHs. The report should describe the basis for summation and should present both summed and un-summed analyses to support the decision to sum contaminant classes. Summation decision rules should be consistent throughout the study area.

#### *Alpha Selection and Error Reduction*

- The Benthic Approach Technical Memorandum includes the following statement in Section 4.3.2: A pair-wise statistical comparison between the test sediment and negative control sediment will be performed following ASTM (2003) and EPA (2000) guidelines. The comparison for each test endpoint (mortality and growth) will initially be based on a statistical significance level (Type 1 error rate) of  $\alpha = 0.05$ . If the analysis of the toxicity test data finds that the power of the data set is low, the alpha level may be raised to 0.1 as suggested in ASTM guidelines (2003). Based on information presented at the November 21, 2005 meeting, it appears that analyses are being performed using an alpha level of 0.05. Based on the government team's initial assessment of the predictive modeling effort, the power of the data set appears to be low. As a result, EPA requests that an alpha of 0.1 should be used to increase the power of the test and the probability of detecting a reduction relative to the control mean and reduce the probability of Type 2 errors that would lead to conclusions that the sample is not toxic (or different from control or reference), when in fact there is a difference. Type 2 errors are important to minimize in environmental investigations, since, if left undetected, these errors can lead to continued short- and long-term effects (ASTM 2003; EPA 2000a).

#### *Methodology for Removing Contaminants from the Models*

- The LWG has proposed removing contaminants on the basis that they are not drivers of toxicity (e.g., aluminum). However, the government team's analysis has shown that some of the eliminated chemicals may be slight predictors of toxicity. The report and analysis should include the complete list of detected contaminants and clearly justify the basis for removal from the modeling effort. The analysis should identify contaminants that are not useful predictors of toxicity throughout the study area, as exhibited by the calculated values, and this will provide justification for dropping contaminants

#### *Evaluation of the effectiveness of the benthic approach*

- The benthic report should include a section that evaluates the model(s) effectiveness at predicting toxicity associated with COCs in the Portland Harbor site. This evaluation should identify COCs for which the model does not effectively predict toxicity and/or locations within the harbor where the model does not perform well. Finally, this section should consider approaches that might be used to address these gaps in the analyses.

#### *Control Normalized Results*

- EPA disagrees that control normalization is an issue raised late in the process. Table 4-1 of the Benthic Approach Technical Memorandum presents the agreed upon approach to control-normalization, which is to subtract the control result from the test result for the mortality

endpoint and divide the test result by control for the growth endpoint. This approach was agreed to based on EPA comments on the Benthic Approach Technical Memorandum. Control-normalization must be performed as described in the Benthic Approach Technical Memorandum. Any deviations should be fully described and the rationale provided. EPA's desire is to create consistency between the two modeling approaches as well as a defensible approach for determining relevant differences between control and test responses.